MULTIMEDIA UNIVERSITY*

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

BMM1014 – MATHEMATICS FOR MANAGERS

(All sections/Groups)

6 FEBRUARY 2023
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with 4 questions only.
2. Attempt **all FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.
5. Students are allowed to use scientific calculators (without restriction).

Question 1

a) ABC Sdn. Bhd. sells its tablet at a price of RM2,588 per unit. The total variable cost is 655Q where Q is the monthly quantity produced and sold by the company. The monthly fixed cost supported by the company is RM289,950.

(i) Formulate the cost function, revenue function and profit function based on the above given information. (3 marks)

(ii) How many units of tablets that the company need to produce and sell to achieve a profit of RM 1million per month? (3 marks)

(iii) If the company is making a loss of RM48,325 per month, how many additional units of tablets need to be produced to achieve break-even? (4 marks)

(iv) What is the new selling price of the tablet if the company wish to obtain a profit of RM200,000 by selling 200 units of tablets per month? (3 marks)

b) A travel agency provides airport transit services from Melaka to KLIA and KLIA2. The travel agency has three types of vehicles available which are bus, van and private car. If 20 passengers take the bus, 5 passengers take the van and 2 passengers choose to take the private car for the airport transit services, then the total fare collected by the travel agency is RM835. On the other hand, the total receipt by the travel agency is RM968 when 13 passengers take bus, 10 passengers take van and 4 passengers take private car. Lastly, 8 passengers take bus, 4 passengers take van and 3 passengers take private car will contribute to the total receipt of RM551. Find the airport transit travel cost for each passenger that charged by the travel agency for the bus, van and private car respectively. (12 marks)

(Total: 25 marks)

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Question 2

A manager is planning to purchase some round tables and banquet tables for the launching of his newly opened restaurant. The manager estimated that the manpower operation cost of a round table and a banquet table are RM358 and RM437 respectively. The price of a round table is RM250 whereas the price of a banquet table is RM330. The manager has a maximum allocation of RM41,250 to spend on the purchase of both types of tables. The number of banquet tables bought must be at least 30% of the number of round tables. Followed the operation planning, the manager has set to have not more than 100 units of banquet tables and must have at least 25 units of round tables. On the other hand, the manager has planned to accommodate 8 seats for a round table and 10 seats for a banquet table. Then, the restaurant can accommodate at least 400 customers during the peak hour of the operation time.

a) Formulate the above problem as a Linear Programming problem to minimize the manpower operating cost of the restaurant. (6 marks)

b) Graph and show the feasible region of the above problem clearly. (6 marks)

c) How many units of round tables and banquet tables should be bought by the manager in order to obtain the minimum operation cost? What is the minimum operating cost? (13 marks)

(Total: 25 marks)

Continued...

Question 3

a) What is the total amount of the saving plan at the end of 36 months if RM3,600 is invested in a saving plan that pays 4.1% annual simple interest? (3 marks)

b) How long will it take for an investment of RM10,500 to grow to an amount of RM42,000 if the investment paid interest at a rate of 3.6% compounded quarterly? (5 marks)

c) Find the principal amount of an investment if the investment plan earned an amount of RM65,000 at the interest rate of 5.5% per year for 3 years compounded continuously. (4 marks)

d) Jason purchased a house at a price of RM550,000. He paid a down payment of 10% of the selling price of the house and secured the loan for the unpaid balance from the bank. The bank charged interest at a rate of 3.8% per annum compounded monthly for a period of 30 years.

(i) What is the monthly installment payment that Jason need to pay? (5 marks)

(ii) What is the total interest paid by Jason for the entire term of this housing loan? (4 marks)

(iii) After making the payments for 8 years, how much is the outstanding payment that Jason still owes to the bank? (4 marks)

(Total: 25 marks)

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Question 4

a) XYZ Sdn. Bhd. is marketing a new product. The selling price of a product is $p = 2x^2 + 40$. The total cost of producing x thousand units of this product is given by $C(x) = x^3 + 12x^2 + 4x - 7$.

(i) Find the profit function based on the above given information. (2 marks)

(ii) How many units of the product must the company produce and sell in order to maximize profit? What is the maximum profit? (8 marks)

b) Evaluate the indefinite integral

$$\int \frac{x+2}{(3x^2+12x+10)^5}\,dx$$

(5 marks)

c) The total profit, in thousands of RM from the produce and sell of x thousands units of product A and y thousands units of product B is given by

$$P(x,y) = -3x^2 - \frac{y^2}{2} + 56x - 16y + 2xy + 1968$$

How many units of each model of product should be produced and sold in order to get maximum profit? What is the maximum profit? (10 marks)

(Total: 25 marks)

End of Paper

LIST OF FORMULAE

1. Quadratic Formula

The solution of the equation $ax^2 + bx + c = 0, a \neq 0$, are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Simple Interest

Interest, I = Prt
(P = principal, r = interest rate, t = number of years)

Accumulated amount, A = P (1 + rt)

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$,
where i = r/m, and n = mt (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

9. Amortization Formula

$$R = \frac{Pi}{1-(1+i)^{-n}}$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \frac{Si}{(1+i)^{n}-1}$$

(R = periodic payment required to accumulate S dollars over n periods)

Calculus

11. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

12. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$